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Avoidable mortality among First Nations adults in Canada: A cohort analysis

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Abstract

Background: Avoidable mortality is a measure of deaths that potentially could have been averted through effective prevention practices, public health policies, and/or provision of timely and adequate health care. This longitudinal analysis compares avoidable mortality among First Nations and non-Aboriginal adults.

Data and methods: Data are from the 1991-to-2006 Canadian Census Mortality and Cancer Follow-up Study. A 15% sample of 1991 Census respondents aged 25 or older was linked to 16 years of mortality data. This study examines avoidable mortality among 61,220 First Nations and 2,510,285 non-Aboriginal people aged 25 to 74.

Results: During the 1991-to-2006 period, First Nations adults had more than twice the risk of dying from avoidable causes compared with non-Aboriginal adults. The age-standardized avoidable mortality rate (ASMR) per 100,000 person-years at risk for First Nations men was 679.2 versus 337.6 for non-Aboriginal men (rate ratio = 2.01). For women, ASMRs were lower, but the gap was wider. The ASMR for First Nations women was 453.2, compared with 183.5 for non-Aboriginal women (rate ratio = 2.47). Disparities were greater at younger ages. Diabetes, alcohol and drug use disorders, and unintentional injuries were the main contributors to excess avoidable deaths among First Nations adults. Education and income accounted for a substantial share of the disparities.

Interpretation: The results highlight the gap in avoidable mortality between First Nations and non-Aboriginal adults due to specific causes of death and the association with socioeconomic factors.

Keywords: Avoidable mortality, cohort analysis, First Nations, premature mortality, preventable mortality, treatable mortality, unavoidable mortality

Avoidable mortality refers to deaths that potentially could have been averted through effective prevention, public health policies, and/or provision of timely and adequate health care.[1] In Canada, avoidable mortality represents 70% of all deaths that occur before age 75.

Avoidable mortality may indicate how primary, secondary and tertiary care, public health services, and health policy are distributed throughout the population.[2,3] Differences in avoidable mortality can be used to assess health inequalities between population groups and geographic regions, and to trace trends over time.[4]

The disproportionate burden of mortality among Aboriginal people, particularly from external causes, is well documented.[5-10] Lower levels of education and income compared with non-Aboriginal people[11] have been identified as determinants of differentials in health.[12-17] These, in turn, are associated with health behaviours that are recognized as factors contributing to health disparities. A number of risk behaviours are more prevalent among First Nations than non-Aboriginal people: alcohol abuse, which is related to increases in mortality[16,18]; smoking, which is related to cardiovascular disease and lung cancer[16]; and lack of exercise and poor diet, which are associated with type II diabetes.[19-21] But despite extensive research on health disparities, detailed analyses of mortality attributable to avoidable causes have not been undertaken at the national level for the First Nations population.

The present study examines avoidable mortality among First Nations adults using a census-mortality linked dataset that incorporates socioeconomic factors. This study investigates: 1) whether First Nations adults have a higher rate of avoidable mortality than non-Aboriginal adults; 2) specific causes of death for which inequalities are greatest; 3) the influence of education and income; and 4) the degree to which differences in avoidable mortality between First Nations and non-Aboriginal adults changed during the 1991-to-2006 period.

Methods

This article is a secondary analysis of data from the 1991-to-2006 Canadian Census Mortality and Cancer Follow-up Study. The Follow-up Study was approved by the Statistics Canada Policy Committee after consultations with the Statistics Canada Confidentiality and Legislation Committee, the Data Access and Control Services Division, and the Federal Privacy Commissioner.

Data sources and study population

Individuals were eligible to be in the original follow-up cohort if they were aged 25 or older and enumerated by the 1991 Census long-form questionnaire, which excluded residents of institutions. To be followed for mortality, census respondents first had to be linked to an encrypted name file abstracted from tax-

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filer data from 1990 and 1991. In-scope census records (n = 2,860,244) with a reported year of birth and postal code information (about 80%) were linked to the name file.

Some population categories were less likely to be matched, and therefore, less likely to be followed: women (less likely to be in the labour force); seniors (more likely to be retired, less likely to be tax-filers); people who were unmarried or not in a common-law union (fewer matching variables available); rural residents (postal codes less precise for matching purposes); movers in the previous year (less likely to match on postal codes); people with less than secondary school graduation (less likely to be employed); people not in the labour force (less likely to be tax-filers); people in the lowest income adequacy quintile (less likely to be tax-filers); and people of Aboriginal ancestry.[22]

The final cohort (n = 2,735,152) represented 15% of the Canadian population. This cohort was then matched to the Canadian Mortality Database (June 4, 1991 to December 31, 2006) using probabilistic record linkage methods primarily based on name and date of birth. Details about the data linkage are reported elsewhere.[22] The present analysis was restricted to cohort members who were younger than age 75 at baseline, and therefore, at risk of premature mortality (First Nations n = 61,220; non-Aboriginal n = 2,510,285).

First Nations

The 1991 Census did not ask respondents if they self-identified as First Nations. Consequently, for this study, cohort members were defined as First Nations if they reported any of the following: 1) a single ancestry of North American Indian; 2) Registered Indian status under the *Indian Act*; 3) membership in an Indian band/First Nation. About three-quarters of the First Nations cohort members met all three criteria; 9% of First Nations cohort members did not report Registered Indian status.[23] Non-Aboriginal cohort members include anyone except those whose census responses indicated North American Indian, Métis or Inuit ancestry, Registered Indian status or membership in an Indian band/First Nation.

Avoidable mortality

To be consistent with previous research, this study defined premature mortality as death before age 75.[1,5] Premature deaths are classified as *avoidable or unavoidable*. *Avoidable* mortality is a death that could potentially have been avoided,[1] based on the list of causes provided by Canadian Institute for Health Information.[1] Avoidable mortality is subdivided into preventable and treatable deaths. *Preventable* mortality is death from causes with well-established and modifiable risk factors; for instance, deaths due to unintentional and intentional injuries, to sexually transmitted infections, and to cancers such as melanoma.[1] *Treatable* mortality is death that potentially could have been averted by screening, early detection and successful treatment; for instance, tuberculosis, pneumonia, and female breast cancer.

Socioeconomic variables

Four categories of educational attainment were defined: less than secondary school graduation; secondary school graduation; postsecondary diploma; and university degree.

Quintiles of income adequacy were constructed. For each economic family or unattached individual, total pre-tax, post-transfer income from all sources was pooled across all family members, and the ratio of total income to the Statistics Canada low-income cut-off for the applicable family size and community size group was calculated.[24] All members of a given family were assigned to the same ratio, which was calculated for the non-institutionalized population (the in-scope population), including people living on Indian reserves. The population was ranked according to that ratio, and quintiles were identified within each census metropolitan area, census agglomeration or rural/small-town area in a given province or territory. Quintiles were constructed within each area to take account of regional differences in housing costs, which were not reflected in the low-income cut-offs.[23]

Analytical techniques

Person-days at risk were calculated for every cohort member from the beginning of the study period (June 4, 1991) to the date they reached age 75, the date of death before age 75, the date of emigration before age 75, or the end of the study period (December 31, 2006). For each category of premature mortality (unavoidable, avoidable, preventable, treatable, and by disease groups that were avoidable), age- and sex-specific mortality rates were calculated by 5-year age group (at baseline). Using the Aboriginal adult cohort population structure (person-years at risk up to age 75) as the standard population (an internal weighting scheme), age-standardized mortality rates (ASMRs) were calculated for each category, by sex and for population subgroups. Rate ratios (RRs) and rate differences (RDs) were calculated, comparing the ASMRs for First Nations with those of non-Aboriginal cohort members. Based on a Poisson distribution, 95% confidence intervals were calculated for the ASMRs, RRs and RDs.

Cox proportional hazard ratios for avoidable mortality for First Nations and non-Aboriginal cohort members were compared. All models were sex-specific. The model first controlled for age at baseline, then for age and education (less than secondary graduation versus secondary graduation or more), and then for age and income adequacy (quintiles 1, 2 and 3 versus quintiles 4 and 5). The final model controlled for age, education and income adequacy simultaneously.

Differences in hazard ratios between the age-adjusted and the final models were interpreted as estimates of the effect of education and income on the disparity between First Nations and non-Aboriginal adults. The proportion of excess mortality explained by differences in education and income was calculated as the difference between the age-adjusted and the final hazard ratios, divided by the age-adjusted hazard ratio minus 1.

Separate models were constructed to compare avoidable mortality of First Nations and non-Aboriginal cohort members for three periods: 1991-to-1996, 1997-to-2001, and 2002-to-2006. Hazard ratios for each age group were calculated. These models were adjusted for age, education and income adequacy. The proportional hazards assumption was verified by visual inspection of log (-log) survival curves.

Results

Baseline characteristics

This study examined mortality outcomes for 61,220 First Nations adults (26,800 men and 34,420 women) and 2,521,285 non-Aboriginal adults (1,261,510 men and 1,248,775 women) during the 1991-to-2006 period. Compared with non-Aboriginal adults, First Nations adults were younger, had lower levels of education and income, and were more likely to live in western and northern Canada (Table 1).

Avoidable, preventable, treatable deaths

More than 40% of all deaths of cohort members that occurred from 1991 to 2006 were premature, that is, before age 75 (data not shown). Compared with their non-Aboriginal counterparts, First Nations cohort members were significantly more likely to die prematurely. The ASMR per 100,000 person-years at risk for First Nations men was 895.5 versus 471.1 for non-Aboriginal men (RR = 1.90) (Table 2). ASMRs were lower for women—631.3 for First Nations women, compared with 273.3 for non-Aboriginal women—but the rate ratio was greater (RR = 2.31)

Avoidable deaths accounted for 76% and 73% of all premature deaths among First Nations cohort men and women, respectively; the corresponding percentages among non-Aboriginal cohort members were 71% and 67%. Compared with non-Aboriginal cohort members, First Nations men were twice as likely to die from avoidable causes; First Nations women, 2.5 times as likely.

These differences were greater than those for *unavoidable* deaths. First Nations cohort men were 1.6 times more likely than non-Aboriginal cohort men to die from unavoidable causes. The risk of unavoidable death for First Nations cohort women was twice that for non-Aboriginal cohort women.

Avoidable deaths that were *preventable* exceeded those that were *treatable* among male and female First Nations and non-Aboriginal cohort members (Table 2).

Avoidable mortality by cause of death

First Nations cohort members' relative risks of death were particularly high for certain avoidable causes. Compared with non-Aboriginal men, First Nations men were significantly more likely to die from alcohol and drug use disorders (RR = 5.43), unintentional injuries (RR = 4.71), and diabetes mellitus (RR = 4.31) (Table 3). However, little difference was apparent in the relative risk of dying from malignant neoplasms.

First Nations women's relative risks of death were significantly high in comparison with non-Aboriginal women for alcohol and drug use disorders (RR = 10.11), diabetes mellitus (RR = 7.97), infections (RR = 6.59), and unintentional injuries (RR = 4.91). As was the case for men, differences were much smaller for malignant neoplasms.

When educational attainment and income adequacy were taken into account, the hazard ratio for dying from avoidable causes was reduced by 47% from 2.09 to 1.58 for First Nations cohort men, and by 32% from 2.58 to 2.08 for First Nations cohort women (Table 4).

Table 1
Percentage distribution of selected characteristics, by sex, First Nations and non-Aboriginal cohort members aged 25 to 74 at baseline, Canada, 1991

	First Nations		Non-Aboriginal	
	Men	Women	Men	Women
Total number	26,800	34,420	1,261,510	1,248,775
Percentage (%)	100	100	100	100
Age group				
25 to 34	42	45	28	31
35 to 44	28	28	27	28
45 to 54	16	15	19	18
55 to 64	9	8	15	13
65 to 74	5	4	11	11
Region				
Atlantic provinces	5	5	8	8
Quebec	12	13	26	26
Ontario	18	17	37	37
Manitoba	18	16	4	4
Saskatchewan	12	13	4	3
Alberta	9	12	9	9
British Columbia	20	19	12	12
Territories	6	5	1	1
Educational attainment				
Less than secondary school graduation	58	55	33	32
Secondary school graduation	33	30	38	36
Postsecondary diploma	7	13	13	19
University degree	2	3	16	13
Income adequacy quintile				
1 (lowest)	42	45	13	17
2	25	24	18	19
3	16	15	22	21
4	11	10	23	21
5 (highest)	7	6	24	21

Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Table 2
Age-standardized premature mortality rates (ASMR) per 100,000 person-years at risk, rate ratios (RR) and rate differences (RD), by sex and type of premature death, First Nations and non-Aboriginal cohort members aged 25 to 74 at baseline, Canada 1991 to 2006

	First Nations					Non-Aboriginal					First Nations compared with non-Aboriginal					
	Premature deaths			95% confidence interval		Premature deaths			95% confidence interval			95% confidence interval			95% confidence interval	
Sex and type of premature death (before age 75)	Number	%	ASMR	from	to	Number	%	ASMR	from	to	RR	from	to	RD	from	to
Men																
Total premature deaths	3,300	100.0	895.5	864.4	927.6	114,985	100.0	471.1	468.2	474.1	1.90	1.83	1.97	424.3	392.6	456.0
Unavoidable	690	20.9	186.5	172.6	201.5	29,455	25.6	118.0	116.6	119.5	1.58	1.46	1.71	68.5	54.0	82.9
Avoidable	2,500	75.8	679.2	652.2	707.3	81,795	71.1	337.6	335.2	340.1	2.01	1.93	2.10	341.6	313.9	369.2
Preventable	1,750	53.0	474.6	452.3	498.1	55,660	48.4	235.1	233.0	237.2	2.02	1.92	2.12	239.6	216.6	262.6
Treatable	750	22.8	204.6	189.9	220.4	26,135	22.7	102.6	101.3	103.9	1.99	1.85	2.15	102.0	86.7	117.3
Women																
Total premature deaths	2,930	100.0	631.3	608.1	655.4	63,170	100.0	273.3	271.1	275.5	2.31	2.22	2.40	358.0	334.3	381.8
Unavoidable	685	23.4	150.5	139.2	162.8	17,735	28.1	76.1	74.9	77.3	1.98	1.83	2.14	74.4	62.6	86.3
Avoidable	2,130	72.6	453.2	433.9	473.4	42,195	66.8	183.5	181.7	185.4	2.47	2.36	2.58	269.7	249.9	289.5
Preventable	1,245	42.5	263.0	248.4	278.3	23,035	36.5	100.3	98.9	101.6	2.62	2.47	2.78	162.7	147.7	177.7
Treatable	880	30.1	190.3	177.7	203.7	19,155	30.3	83.2	82.0	84.5	2.29	2.13	2.45	107.0	94.0	120.0

Notes: Reference population (person-years at risk) for age-standardization was taken from the Aboriginal age distribution (5-year age group). The total number of premature deaths exceeds the sum of unavoidable and avoidable deaths because of premature deaths with no cause-of-death information (0.4%).
Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Table 3
Age-standardized avoidable mortality rates (ASMR) per 100,000 person-years at risk, rate ratios (RR) and rate differences (RD), by sex and cause of death, First Nations and non-Aboriginal cohort members aged 25 to 74 at baseline, Canada, 1991 to 2006

	First Nations					Non-Aboriginal					First Nations compared with non-Aboriginal					
	Avoidable deaths			95% confidence interval		Avoidable deaths			95% confidence interval			95% confidence interval			95% confidence interval	
Sex and cause of death	Number	%	ASMR	from	to	Number	%	ASMR	from	to	RR	from	to	RD	from	to
Men																
Diseases of circulatory system	720	28.8	195.5	181.2	210.9	30,850	37.7	119.8	118.4	121.2	1.63	1.51	1.76	75.7	60.7	90.6
Unintentional injuries	455	18.2	123.2	112.3	135.1	4,655	5.7	26.2	25.4	27.0	4.71	4.27	5.19	97.0	85.5	108.4
Lung cancer	200	8.0	54.3	46.9	62.8	14,420	17.6	53.9	53.0	54.9	1.01	0.87	1.17	0.3	-7.7	8.3
Diabetes mellitus	190	7.6	50.6	43.7	58.4	3,020	3.7	11.7	11.3	12.2	4.31	3.71	5.01	38.8	31.5	46.2
Alcohol and drug use disorders	185	7.4	50.1	43.2	58.1	2,115	2.6	9.2	8.8	9.7	5.43	4.65	6.34	40.9	33.5	48.3
Infections	135	5.4	36.9	30.9	44.0	3,065	3.7	14.9	14.4	15.5	2.47	2.06	2.96	21.9	15.4	28.4
Suicide and self-inflicted injuries	135	5.4	36.2	30.5	43.0	3,755	4.6	22.4	21.6	23.1	1.62	1.36	1.93	13.8	7.5	20.1
Other neoplasms	115	4.6	31.9	26.2	38.9	7,440	9.1	30.1	29.4	30.8	1.06	0.87	1.30	1.9	-4.5	8.2
Diseases of respiratory system	85	3.4	23.6	19.0	29.4	4,410	5.4	16.2	15.7	16.7	1.46	1.17	1.82	7.4	2.2	12.6
Colorectal cancer	65	2.6	18.1	14.0	23.4	4,590	5.6	17.8	17.3	18.4	1.02	0.79	1.31	0.3	-4.4	4.9
Other causes[†]	215	8.6	58.8	51.3	67.5	3,485	4.3	15.3	14.8	15.9	3.84	3.33	4.42	43.5	35.4	51.6
Women																
Diseases of circulatory system	475	22.3	105.5	96.1	115.8	11,195	26.5	45.2	44.4	46.1	2.33	2.12	2.57	60.3	50.4	70.2
Diabetes mellitus	225	10.6	48.7	42.6	55.6	1,515	3.6	6.1	5.8	6.4	7.97	6.90	9.20	42.6	36.1	49.1
Unintentional injuries	220	10.3	44.3	38.8	50.6	1,710	4.1	9.0	8.6	9.5	4.91	4.26	5.66	35.3	29.4	41.2
Lung cancer	175	8.2	36.4	31.3	42.3	7,865	18.6	33.2	32.4	33.9	1.10	0.94	1.28	3.2	-2.3	8.7
Infections	155	7.3	33.8	28.8	39.8	1,175	2.8	5.1	4.8	5.5	6.59	5.55	7.83	28.7	23.2	34.2
Other neoplasms	145	6.8	30.3	25.7	35.6	3,820	9.1	17.2	16.6	17.8	1.76	1.49	2.08	13.1	8.1	18.0
Alcohol and drug use disorders	145	6.8	30.2	25.6	35.6	625	1.5	3.0	2.8	3.2	10.11	8.40	12.15	27.2	22.2	32.2
Malignant neoplasm of breast	130	6.1	27.9	23.5	33.3	6,380	15.1	29.4	28.6	30.1	0.95	0.80	1.14	-1.4	-6.3	3.5
Diseases of respiratory system	110	5.2	24.7	20.3	29.9	2,380	5.6	9.3	8.9	9.7	2.66	2.18	3.24	15.4	10.6	20.2
Colorectal cancer	80	3.8	16.8	13.3	21.2	2,620	6.2	11.1	10.7	11.5	1.51	1.20	1.91	5.7	1.8	9.6
Suicide and self-inflicted injuries	60	2.8	12.0	9.3	15.5	1,045	2.5	6.1	5.8	6.5	1.96	1.51	2.54	5.9	2.8	8.9
Other causes[†]	200	9.4	42.6	36.9	49.2	1,880	4.5	8.8	8.4	9.2	4.84	4.16	5.62	33.8	27.7	39.9

[†] diseases of digestive system, infant and maternal causes, disease of genitourinary system, neurological disorders, disorders of musculoskeletal system, adverse effects of medical and surgical care, injuries of undetermined intent, assault, nutritional deficiency anaemia, thyroid disorders, adrenal disorders, congenital metabolic disorders

Note: Reference population (person-years at risk) for age standardization was taken from the Aboriginal age distribution (5-year age group).
Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Disparities widen slightly over time

To identify changes in the risk of avoidable mortality over time, 1991-to-1996, 1997-to-2001, and 2002-to-2006 were examined separately. Hazard ratios adjusted for age, educational attainment and income adequacy showed slightly elevated risks in later periods for First Nations cohort members, compared with non-Aboriginal cohort members. The hazard ratios for avoidable mortality in the 1991-to-1996 period were 1.50 and 2.08 for First Nations cohort men and women, respectively (Table 5). By 2002-to-2006, the hazard ratios had risen slightly to 1.71 and 2.18 for First Nations cohort men and women, respectively.

Highest risk in youngest age group

When educational attainment and income adequacy were taken into account, the hazard ratio for dying from avoidable causes for First Nations compared with non-Aboriginal cohort members was higher in younger age groups (Table 6). For First Nations cohort members aged 25 to 34 at baseline, the hazard ratio was 2.20 for men and 2.61 for women. At ages 65 to 74, the hazard ratio was not statistically significant for First Nations men and was considerably lower for First Nations women (1.70).

Discussion

Consistent with other research,[6,7] First Nations cohort members were at higher risk of dying prematurely and from avoidable causes, compared with their non-Aboriginal counterparts. The disparity was particularly evident among women and younger age groups. Differences were also apparent for unavoidable deaths, but the gap was narrower.

Diabetes, alcohol and drug use disorders, and injuries were the causes contributing most substantially to excess avoidable deaths among First Nations cohort members. Previous research has reported risk factors for such conditions—smoking,[16] alcohol abuse,[16,18] obesity,[19] and poor diet[20,21]—to be more prevalent among First Nations individuals than among non-Aboriginal people. Future research might focus on the roles of prevention strategies and health care interventions for specific causes of avoidable mortality that were found in this study.

Compared with non-Aboriginal people, First Nations people have lower levels of education and income[11]—factors that are fundamental determinants of disease, illness and injury.[12-17] In models that controlled for educational attainment and income adequacy simultaneously, hazard ratios for avoidable mortality among First Nations cohort members were reduced by 47% for men and 32% for women, suggesting that these socioeconomic variables are important in explaining the disparity.

Table 4
Hazard ratios for avoidable mortality, by sex, adjusted for age, education and income adequacy, First Nations compared with non-Aboriginal cohort members aged 25 to 74 at baseline, Canada, 1991 to 2006

	Men			Women		
		95% confidence interval			95% confidence interval	
Ajusted for:	Hazard ratio	from	to	Hazard ratio	from	to
Age	2.09	2.01	2.17	2.58	2.47	2.70
Age + education	1.91	1.83	1.99	2.44	2.34	2.55
Age + income adequacy	1.65	1.59	1.72	2.14	2.05	2.24
Age + education + income adequacy	1.58	1.52	1.64	2.08	1.99	2.18

Note: Models adjusted for age in years (continuous) at baseline, education (secondary graduation or more versus less than secondary graduation) and income adequacy quintiles (1, 2, or 3 versus 4 + 5 combined).
Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Table 5
Hazard ratios for avoidable mortality, by sex, adjusted for age, education and income adequacy, First Nations compared with non-Aboriginal cohort members aged 25 to 74 at baseline, Canada, 1991-to-1996, 1997- to-2001 and 2002-to-2006

	Men			Women		
		95% confidence interval			95% confidence interval	
Period	Hazard ratio	from	to	Hazard ratio	from	to
1991- to-1996	1.50	1.38	1.62	2.08	1.90	2.27
1997-to-2001	1.65	1.53	1.77	2.01	1.85	2.18
2002-to-2006	1.71	1.60	1.83	2.18	2.03	2.34

Note: Models adjusted for age in years (continuous), education (secondary graduation or more versus less than secondary graduation) and income adequacy quintiles (1, 2, or 3 versus 4 + 5 combined).
Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Table 6
Hazard ratios for avoidable mortality, adjusted for education and income adequacy, by age group and sex, First Nations compared with non-Aboriginal cohort members aged 25 to 74 at baseline, Canada, 1991 to 2006

	Men			Women		
		95% confidence interval			95% confidence interval	
Age group at baseline	Hazard ratio	from	to	Hazard ratio	from	to
25 to 34	2.20	1.99	2.42	2.61	2.34	2.91
35 to 44	1.92	1.77	2.10	2.13	1.94	2.35
45 to 54	1.54	1.43	1.67	1.89	1.73	2.06
55 to 64	1.24	1.14	1.34	1.97	1.81	2.15
65 to 74	1.07	0.93	1.24	1.70	1.45	2.00

Note: Models controlled for education (secondary graduation or more versus less than secondary graduation) and income adequacy quintiles (1, 2, or 3 versus 4 + 5 combined).
Source: 1991-to-2006 Canadian Census Cohort Mortality and Cancer Follow-up Study.

Relative inequalities in avoidable mortality between First Nations and non-Aboriginal cohort members were greater among women than men. As well, hazard ratios for avoidable mortality among First Nations cohort members increased over the follow-up period, similar to a trend toward widening disparity that was reported in Australia.[2]

What is already known on this subject?

- In Canada, avoidable mortality—deaths that potentially could have been averted through prevention and/or effective health care—accounts for 70% of all deaths that occur before age 75.
- Detailed analyses of mortality attributable to avoidable causes have not been undertaken at the national level for the First Nations population.

What does this study add?

- The present study examines avoidable mortality among First Nations adults using a census-mortality linked dataset that incorporates socioeconomic factors.
- During the 1991-to-2006 period, First Nations adults had more than twice the risk of dying from avoidable causes compared with non-Aboriginal adults.
- Diabetes, alcohol and drug use disorders, and unintentional injuries were the main contributors to excess avoidable deaths among First Nations adults.
- Education and income accounted for a substantial share of the disparities in avoidable mortality.

Limitations

The data used in this analysis excluded people who were not enumerated by the 1991 Census long-form questionnaire (3.4% of the total population). These missing individuals were disproportionately young, mobile, living in low-income households, of Aboriginal ancestry,[25] homeless, and residents of Indian reserves.[26] A total of 78 Indian reserves and settlements were incompletely enumerated by the 1991 Census. In addition, because only tax-filers could be followed for mortality, linkage rates to the name file abstracted from tax-filer data were lower for First Nations (54%) than non-Aboriginal census respondents (77%). Nontheless, the socioeconomic profile of First Nations cohort members was similar to that of all First Nations long-form census respondents, suggesting that little bias existed in the first linkage.[23]

Because questions on self-perceived Aboriginal identity were not asked in the 1991 Census, this study defined First Nations people by ancestry, Registered Indian status under the *Indian Act*, or membership in an Indian band/First Nation. This definition excludes people who reported both Aboriginal and non-Aboriginal ancestries (and did not indicate being a Registered Indian or member of an Indian band/First Nation), a group whose census characteristics were closer to those of non-Aboriginal people than to First Nations people as defined for this study.[23] On the other hand, the definition used for this analysis may include non-Aboriginal individuals who became members of an Indian band/First Nation through marriage.

Province of residence, educational attainment and income adequacy were measured only at baseline (June 4, 1991) and may not reflect the situation of cohort members later in the follow-up period.

The small size of the First Nations cohort did not allow analyses by detailed causes of death.

Some suicides may have been misclassified as another cause of death such as drowning, poisoning or other injury. Reporting of suicides may also differ by jurisdiction (reserves, towns, cities).[5]

Because the data exclude the population younger than 25, the role intentional and unintentional injuries in avoidable mortality is underestimated.

No internationally agreed-upon definition of avoidable mortality exists. In addition, because of cross-national differences in coding practices and timeliness of the data,[1] international comparisons should be undertaken cautiously.

Conclusion

Compared with non-Aboriginal cohort members, premature deaths among First Nations cohort members were more likely to be attributable to avoidable causes. The difference was particularly pronounced among First Nations women and younger age groups, and for causes such as unintentional injuries, alcohol and drug use disorders, and diabetes mellitus. Low income and education explain a substantial share of these differences in avoidable mortality. ■

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